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The Outdoor Apparel Industry:Measuring the Premium for Sustainability with a Hedonic Pricing Model

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THE OUTDOOR APPAREL INDUSTRY: MEASURING THE PREMIUM FOR SUSTAINABILITY WITH A HEDONIC PRICING MODEL

By

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Abstract

Evaluating the existing practices of sustainability within the outdoor apparel industry, this research questions the relationship that certain sustainability aspects have with the price of goods in this specific market. Through a hedonic pricing model, this research provides an estimate of the value placed on certain aspects surrounding environmental and social sustainability. In a growing industry, the application of sustainable practices throughout the supply chain has the potential to influence customer purchasing patterns and pricing models for outdoor apparel brands. This research found the type of material used to have a statistically significant impact on the price of an item; no statistical significance was found in the level of brand sustainability.

Introduction

When shopping for anything, a consumer's brain makes conscious and unconscious calculations about the relevant factors to determine whether or not those qualities are worth the price on the price tag. Throughout the country, clothing and apparel have become a necessity for Americans in living their day-to-day lives, making the apparel industry one of the biggest markets in not just the in the United States, but the world as a whole. The clothing we wear is the skin we have the capability to choose for ourselves, incentivizing consumers to purchase apparel that represents how they want to be seen by others. Clothing brands recognize this and use it to their advantage, noticing trends and providing consumers with lines of clothing that result in more sales.

One of the more recent trends in America has in outdoor recreation, causing an increase in the demand for outdoor apparel. Outdoor recreation plays a significant role in the daily lives in many Americans; being outdoors provides a space to find physical, spiritual and mental benefits,

a healthy sense of curiosity for the natural world, and a space to develop skills for living a happy and healthy life. The recognition of these benefits has leaked into the American economy; starting two years ago in 2016, the Outdoor Recreation Industry became its own sector in the national GDP when President Obama signed the Outdoor Recreation Jobs and Economic Impact Act. This led the Bureau of Economic Analysis (BEA) to measure the outdoor recreation industry with the same metric as other industries and found outdoor recreation to be valued at $373 billion, accounting for 2% of the GDP and larger than oil and mining. It has been growing at 3.8% per year, faster than the overall economy which is at 2.8% per year (Reimers, 2018).

In theory, the consumers of outdoor apparel are also the users of public lands and outdoor spaces who therefore value the protection of them and the natural environment as a whole. Although the economic impact of the outdoor industry has been on a positive trend with steady growth, the environmental cost is just as profound. The retail trade industry within the outdoor industry in 2016 accounted for $81.7 billion, 21.9% of activity within the outdoor industry economy (Highfill, Howells, & Aversa, 2018). The outdoor industry tends to be viewed as environmentally 'green' and practicing environmental stewardship but many companies are not as transparent as the public might think (Butow). This research will use data previously collected about sustainable practices of outdoor apparel brands and evaluate the relationship of those sustainable practices with the price of apparel through the lens of corporate social and environmental responsibility.

Along with the growth in outdoor recreation participation, one of the other forms of environmental impact is the clothing that is made for, purchased, and used by outdoor recreationalists. Outdoor recreational activities often require styles of clothing and certain

materials which are more breathable for strenuous activities and durable to protect against the elements. Polyester, for example, is a material that wicks sweat and is not used as commonly in industries such as fast fashion.

Brands such as REI, Patagonia, Nike, and Black Diamond contribute to the outdoor apparel industry where sustainability practices are of particular importance and interest to consumers (Dargusch & Ward, 2010). The retail market for outdoor apparel in 2005 was valued at $33.3 billion; consumers tend to affiliate sustainability with these companies and perceive companies within this sector to have a dedication to values of corporate responsibility. Corporate responsibility is defined by Dargusch and Ward as a "concept that encapsulates good corporate citizenship, corporate social investment and the due recognition of a business' social obligations to its stakeholders" (Dargusch & Ward, 2010, p. 1) which applies throughout the supply chain of production, encouraging companies to be conscientious of working conditions, fair pay at suppliers' factories, and the environmental cost of producing materials and fabrics (Dargusch & Ward, 2010).

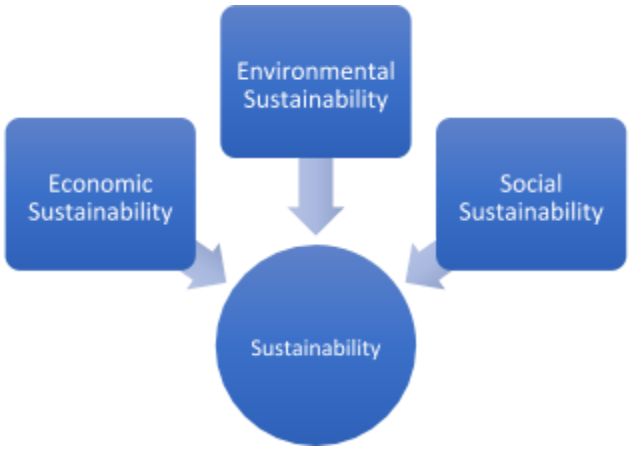
For example, Patagonia and REI, two large and influential companies within the outdoor apparel industry, have incorporated practices of taking back used apparel to resell it, providing consumers with the guidance on how to fix their own gear, and recycling clothing. The intersection of business and social responsibility is of particular concern and relevance for the outdoor industry; in order for the outdoor industry to continue to thrive and to grow in a responsible, current practices and pricing structures must be evaluated and critiqued in order to gain a better understanding of the scope of social and environmental impact.

This research acknowledges the different factors involved in pricing clothing, looking specifically at the statistical significance of brand sustainability measures, types of materials, and how those materials are produced (such as organic or recycled). Although brand sustainability does not have a statistically significant impact over the price of outdoor apparel, understanding the factors that do impact price, such as material type, can help brands with sustainability initiatives and pricing strategies. An example of a sustainability initiative could be spending energy and resources on researching ways to recycle certain materials or effective programs to sell used clothing.

Review of Literature

Environmental Sustainability

The term 'sustainability' has many different definitions depending on the application and the context. In many spheres, it has become a buzzword used both socially and corporately, often with a positive association. Morelli specifies in his paper on *Environmental Sustainability: A Definition for Environmental Professionals* that environmental sustainability is different from social sustainability and economic sustainability but remains connected.



In Morelli's paper, the framework of sustainability is supported through the argument for a "three-legged" approach which simultaneously encourages social, economic, and environmental benefit. There is ongoing debate about this particular approach and argued that 'sustainability' is rather a relationship exclusively between human society and nature. According to Morelli, sustainability can be applied to a number of spheres, but must be contextualized in order to apply it to a framework (Morelli, 2011).

This paper uses the balanced relationship between environmental sustainability, social responsibility, and economic sustainability as a lens. Social sustainability is not an element of empirical or theoretical study in this paper, but remains an integral part of the context of this framework.

Intersection of Economic and Environmental Sustainability

Morelli highlights George Foy's paper on *Economic Sustainability and the Preservation of Environmental Assets* that "the core requirement of sustainability is that current economic activities should not result in an excessive burden on future generations" (Foy, 1990, p. 771).

Foy evaluates the feasibility of valuing environmental assets and questions the ethics of using natural resources for the pure sake of 'efficiency.' To inform decision making relating to environmental assets, Foy suggests the integration of an ecological approach in combination with an economic approach. With the many existing definitions and contexts of sustainability throughout the world and over the course of economic history, Foy's argument is that today, an ecological approach to sustainability should be a limiting factor within the economic approach when allocating environmental assets. Instead of ecological sustainability exclusively applying to environmental sustainability, it becomes integrated into the economic sector.

There has been agreement within the economic community that intergenerational equity is part of long-term sustainability and present-day economic efficiency brings benefit to future generations. Foy concludes that the primary aspect of sustainability is ensuring that no disproportionate burden falls upon future generations. Therefore, environmental preservation and management are integral to sustain a livable environment on a local, regional, and global level. Foy believes that traditional economic analysis should be focused on minimizing the social costs rather than allowing it to determine the safe standards of environmental asset management (Foy, 1990). Incorporating the emphasis of economic sustainability into business models is necessary as the entire supply chain within an industry has an impact on the environmental sustainability of a given manufacturer.

Design for Environmental Sustainability in the Supply Chain

In recent years, a new form of product development research, referred to as "design for" or DFX, has surfaced. DFX is a theoretical framework that integrates supply chain and

environment in an effort to encourage sustainability. In the paper *Design for Sustainability (DFS): The Intersection of Supply Chain and Environment,* Arnette et al. theorize that DFX techniques can be put in the context of sustainability at the intersection of economics, ecology (under the umbrella of environmental sustainability), and social equity. The relevant concept that they develop in this paper is a "design for" strategy that incorporates remanufacture, reuse, and recycle as one of the environmentally-friendly approaches for the end-of-life stage of a product. This paper calls for further research on the relationship between DFX theory with both sustainability theory and empirical testing. Since the development of DFX is recent, previous literature predominantly follows theoretical frameworks and research rather than empirical research.

The economic relevance of DFX is found in its implementation throughout an entire supply chain which then translates in affecting the overall "economic health" of the company (Arnette, Brewer, & Choal, 2015, p. 377). Dimensions within DFX include design for assembly, manufacture, disassembly, serviceability, quality, mass customization, cost, supply chain, recyclability, remanufacture, life-cycle, and environment. These dimensions address the necessary collaboration of supply chain and environment, rather than them being mutually exclusive. Through this research, the authors intend to inspire manufacturers to give their products greater value and level of performance beyond just the initial purchase by the customer and considering the entire cycle as a whole. Sustainable applications that fit within these boundaries can be seen through existing practices.

Existing Sustainable Practices

An example of current practices can be found in the paper *Waste and Pollution Management Practices by German Companies* which looks at the practices of different German companies regarding waste and pollution management within different industries. The researches divided their findings into three areas: reuse and recycle, waste disposal and pollution control and the practices implemented. The results from this study showed that sustainable practices are more closely related to the culture and values of a company rather than the characteristics specific to the industry. The definition used for sustainable supply chain management in this paper is "the strategic, transparent integration and achievement of an organization's social, environmental, and economic objectives in the systemic coordination of key inter-organizational business processes for improving the long-term performance of the firm and its supply chain partner" (Ageron, Gunasekaran, & Spalanzani, 2012).

Ageron et al. see companies as having the capability of having a lasting impact on nature and society. When it comes to reuse and recycling, companies should prioritize the reverse flow of goods where customers are directed to take used materials and waste to appropriate facilities. Alternatively, companies can also use a forward supply chain which serves the retail sector because materials and used products can be repurposed and lead to a decrease in the carbon footprint in urban areas. Through the lens of product sustainability, practices such as remanufacturing and refurbishing are preferred and viewed as superior to recycling in order to use the original product longer[1].

[1] When a product is remanufactured, a used product gets transformed into like-new condition, incorporating both new and reused parts. Refurbishment takes the same product, fixes it using the original parts, and sells it in better condition without using new parts. Refurbishment prioritizes the quality of a good. (Ullwer, Campos, & Straube, 2016). The automotive industry is

Practices of remanufacturing and refurbishment work better in some industries more so than others. For example, Ullwer et al. found that refurbishment and remanufacturing did not seem to fit into industries involving chemicals and pharmaceuticals. However, these practices can be more effectively implemented into the automobile and retail markets (Ullwer, Campos, & Straube, 2016).

End of Life and Refurbishment: The Automotive Industry

An example of a company within the automotive industry intentionally incorporating sustainable end-of-life practices is BMW which has an approach called DFD (Design for Disassembly). In this approach, DFD incorporates the time, cost, and resources needed to dismantle a vehicle at the end of its useful life. Those costs are then incorporated into the initial cost of the car at the time of sale. At BMW, 85% of the materials are recyclable and 10% can be used for energy generation (Callan & Thomas, 2013). BMW has established a network of locations when BMW automobile owners can take back parts and recycle their vehicles at recycling centers throughout the EU. This kind of infrastructure allows for owners to have a more accessible way of disposing their cars at the end of their economic life.

In a related paper titled *End of Life Vehicles Recovery: Process Description, Its Impact and Direction of Research*, researchers Zameri and Saman found that with recycling industries gaining in popularity, automotive manufacturers have been leaders in improving the process of recycling vehicles due to the financial benefit. Through using reusable materials, the production cost becomes less expensive as those materials are less financially costly than new materials and

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one that has been studied and researched regarding different practices of refurbishment and repurpose.

there is a lesser need for landfill space. Along similar lines to Arnette et al.'s research on Design for Sustainability, Zameri and Saman have observed that Design for Recycling (DFR) and Design for Environment (DFE) are the most valued considerations in the process of developing a vehicle. Zameri and Saman conclude that elements throughout the vehicle development process can be improved in order to increase efficiency in the recycling, refurbishment, and repurpose process. To do this, they recommend improved logistics networks, specifically for the infrastructure built around recycling and the establishment of stable markets for recycle materials (Zameri & Saman, 2006).

Implementing Environmentally Responsible Systems

Logistics systems, as laid out by Haw-Jun and Dunn in *Environmentally Responsible Logistics Systems,* are relevant when considering environmental management. Their research provides an overview of "environmentally responsible logistics activities" and the impact on their respective industries (Haw-Jan & Dunn, 1995). According to the US National Academy of Sciences and the Royal Society of London, "if current predictions of population growth prove accurate and patterns of human activity on the planet remain unchanged, science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world" (Haw-Jan & Dunn, 1995, p. 2). Higher demand from customers for 'green' products and environmentally responsible management within businesses incentivizes companies to act green. This is also in combination with legal and financial consequences of mismanagement; situations such as the Exxon Valdez oil spill have seen a backlash from

customers who demand a more 'green' approach to management and more environmental responsibility.

Haw-Jun and Dunn define environmental responsibility as "improving operational efficiency by conserving resources and reusing them as much as possible… businesses can cut costs by conserving energy, reducing resources used, and reusing and recycling useable materials" (Haw-Jan & Dunn, 1995, p. 2). When firms focus on cost minimization and profit maximization, it leads to an improved process and greater emphasis on pollution prevention. According to Haw-Jun and Dunn, environmentally conscious decisions can and should be made on both big and small scales. The suggested application is "integrative environmental management" which means that there is a focus on low environmental impact throughout the entire supply chain and from the beginning to end of a given product's life cycle (Haw-Jan & Dunn, 1995). However, in order to improve, a measure of evaluation must be established and used.

Apparel Industry: Evaluating Sustainability

Similar to the automotive industry, the apparel industry has the opportunity to take advantage of recycled and reusable materials. In *Materials and Manufacturing Environmental Sustainability Evaluation of Apparel Product: Knitted T-Shirt Case Study,* researchers Khan and Islam have noticed that "over the past few years, increasing awareness of the environmental and social concerns surrounding the fashion industries and consumers has led to a rise in the implementation of sustainability initiatives" (Khan & Islam, 2015, p. 1). Through the case study of different brands of knitted t-shirts, they found that a single cotton shirt weighing 0.5 pounds

takes 700 gallons of water, 0.2 pounds of fertilizer, and emits 6 pounds of Co2, 1.2 pounds of fossil fuels, and 0.11 pounds of other gases. That same t-shirt creates 18.3 pounds of JCO2 emissions on average from the washing and dying of it 50 times in the US.

When one buys a shirt or any article of clothing, the environmental impact goes throughout the supply chain; the materials used, resulting wastes from those materials, packaging, how it is produced, where the item is made and sold, energy from transportation, and the use and disposal of the item once in the hands of a consumer. However, consumers over the last few years seem to be drawn to apparel brands that are eco-friendly, encouraging companies and manufacturers to find less environmentally costly systems and cleaner technologies that can be incorporated throughout the supply chain. Khan and Islam theorize that "sustainable apparel products can be defined as a part of the growing design philosophy and trend of sustainability, the goal of which is to create a system which can be supported indefinitely in terms of environmentalism and social responsibility" (Khan & Islam, 2015, p. 2). They found that the areas with the greatest environmental impact are the natural resources used in production, how those resources are used, if they can be replaced or replenished, the impact of the final production on the environment, and where the product goes once it is disposed of.

All manufactured products cause some level of environmental degradation, whether it is during manufacture, use, or disposal. To evaluate this, phases within the product's life cycle can be assessed in order to determine the most impactful phases in order to effectively reduce that environmental impact. Khan and Islam introduce the Higg Index which was established by the Sustainable Apparel Coalition in order to create a standard tool in order to evaluate environmental sustainability. The Sustainable Apparel Coalition, otherwise known as the SAC,

was formed in 2011 by several apparel companies and nonprofits as a tool to assess the level of sustainability of a product. The SAC aspires to create a common measurement to evaluate apparel and footwear sustainability. In doing so, manufacturers can gain a better understanding of what areas of production can be improved (Khan & Islam, 2015). Companies can change the level of sustainability of their product and its environmental impact through choosing different types of fiber, methods of processing, and reuse and recycle programs. The researchers conclude that with apparel industries being historically known for being significant contributors to waste and pollution, a movement towards a greener world will include the evaluation of apparel from the beginning to the end of its usable life. To further address the present issues and areas for improvement, it is necessary to isolate specific sectors within the apparel industry. The research of this paper will look specifically at the outdoor apparel industry.

Outdoor Apparel: Existing Practices and Issues

As mentioned in previous literature, customers have not been overly concerned with purchasing "green" apparel over conventional apparel until somewhat recently. In the paper *Sustainability Issues and Strategies in the Outdoor Apparel Brand Industry* by John Butow, Butow writes that "the outdoor apparel industry with their history of championing environmental conservation efforts can serve as an industry leader by implementing product sustainability efforts across their supply chain to influence other apparel brands and actors within the textile supply chain to employ green practices" (Butow, 2014, p. 1). The first research question of this study is if outdoor recreationalists, the predominant consumers of outdoor products and apparel, would be receptive to buying green apparel at a higher price. Butow's research also addresses the environmental impacts of outdoor apparel life cycles, best practices within the industry that are

sustainable and advocated for by industry trade associations, and established implementations that serve as a benchmark of product sustainability in available literature. At the time of publication in 2014, this research found that 5 out of 14 brands had visible and comprehensive sustainability strategies (Butow, 2014). Butow questions if these brands can serve as examples and pave the way for mainstream brands to also develop sustainable practices.

There is a gap in available existing literature regarding the economic significance of sustainable practices within the outdoor apparel industry. Review of literature shows that sustainability, incorporating both environmental and economic sustainability, is considered a necessary aspect of product development. However, it is necessary to evaluate the impact of such sustainability practices through an economic framework to determine what their economic impact is, if at all.

This research will address questions regarding the impact of different factors on the price of outdoor apparel, testing the hypothesis that the existence of sustainability practices and measures generate a premium on clothing. Highlighted literature shows that there is incentive from both producer and consumer standpoints to have sustainable practices in the outdoor apparel industry; this research aims to estimate the statistical and economic incentive of such practices.

Theory, Data, Model, and Results

Theory

The economic theory used in this research is through the lens of intersectional sustainability which defines sustainability as being equal parts economic, environmental, and

social. Using this theory and applying it to the outdoor apparel industry, consumer spending patterns and brand retailers are expected to reflect values of sustainable practices in their prices of clothing. In this research, sustainability can is represented in three ways: initiatives supported and practiced by the brand as a whole, the materials used (based on production), and certifications or labels given to specific items of clothing.

Data

The data for this research was self-compiled and collected on the online websites of twelve different outdoor apparel brands, totalling in 84 observation points. The data collected from each of these sites included the price of the item, the material of the item, and whether the item was described as organic, recycled, or Bluesign Approved[2]. Data on the sustainability of a given brand was collected from J. Butow's research on *Sustainability Issues and Strategies in the Outdoor Apparel Brand Industry.* The brands used to create this model are based on the Butow's data selection.

The data used for Butow's work was compiled by reviewing membership lists from the SAC website and members of the OIA Sustainability Working Group which identified brands with interest in sustainable practices and specifically targeting consumers interested in outdoor recreational activities. Brands were also chosen based on having a sizable apparel line rather than being primarily footwear.

Larger brands, such as Nike, who are members of either of both the OIA SWG or SAC were intentionally not included "due to their already large market penetration for general recreation apparel and mainstream sporting goods" (Butow). Brands were also only chosen out

[2] Bluesign technologies evaluate resources consumption throughout the supply chain of a product or item. Bluesign helps apparel brands manage the materials in production processes.

of North America. In Butow's original study, 14 brands were included and this paper includes 12 of the 14. The brands not included from Butow's research are Mountain Hardwear and Quiksilver in order to avoid collinearity because Mountain Hardwear's parent company is Columbia which is already included.

Brands included from Butow's benchmarking evaluation:

Brand	**Organization**	**Headquarters Location**
Black Diamond	OIA SWG	Salt Lake City, UT
Burton	OIA SWG	Burlington, VT
Columbia	OIA SWG, SAC	Portland, OR
EMS (Eastern Mountain Sports)	OIA SWG	Peterborough, NH
LL Bean	SAC	Portland, ME
Marmot	OIA SWG, SAC	Santa Rosa, CA
MEC (Mountain Equipment)	OIA SWG, SAC	Vancouver, BC
Outdoor Research	OIA SWG	Seattle, WA
Patagonia	OIA SWG, SAC	Ventura, CA
prAna	OIA SWG	Carlsbad, CA
REI (Recreational Equipment, Inc.)	OIA SWG, SAC	Seattle, WA
The North Face	OIA SWG, SAC	San Leandro, CA

Some brands included in this research are retailers of other brand's clothing lines, but sustainability measures were only taken from the product line of the individual brand being

evaluated. For example, data from a cotton shirt from REI was an REI brand shirt rather than a outside brand that REI retails.

Variables

The hedonic outdoor apparel price model was estimated through creating a comprehensive list of 84 outdoor apparel items from different brands. The dependent variable was the price of the item listed on a brand's website. The item's primary material (at least over 75% of an item's makeup) used was then collected. The most prevalent materials used in outdoor clothing are cotton, polyester, wool, and nylon because of their breathability, quickness to dry, comfort during strenuous activity, and durability. Butow's research found that throughout a garment's life cycle, the most environmentally impactful stage was during production and use compared to transport and end-of-life (Butow). The categories evaluated for the four material types were energy use, water use, GHG (greenhouse gas) emissions, wastewater production, chemical use in finishing, and land use requirement; each fiber was given a grade of 1 through 4 with 1 being relatively low impact and 4 being relatively high impact. Although wool was found to have the least environmental impact overall, the production of wool can involve overgrazing by herds and sheep and chemicals used for sheep food and impact of wastewater. In this research, an index of the environmental impact of a given material was created by taking the ranking of each category and finding the mean value among a material's rankings.

The next variable included for an outdoor garment was the brand labels found on an item's site. The brand label index had a value between 0 and 3 for each item, determining if an item was organic, recycled, or bluesign approved. For each label that was satisfied, an item would get an score of 1 and then would be added up to create an index. Because such labels are

visible to consumers when purchasing the item, the labels of 'organic', 'recycled', and 'bluesign approved' could potentially influence the consumers' purchasing decision.

The third index included in this research is the brand sustainability index which is based off of the data collected by Butow about the sustainability practices of a given brand. Butow's benchmarking tool helps determine the sustainability efforts of different brands. The questions were divided into five sections: general sustainability information, production and processing, transport, use, and end-of-life. The questions included in this research's brand sustainability index:

1. *OIA SWG member?*
2. *SAC member?*
3. *Is there a publicly available environmental mission statement?*
4. *Offer information describing the environmental impact of apparel manufacture?*
5. *Offer sustainable apparel verified by a 3rd party?*
6. *List code of conduct requiring compliance with environmental laws?*
7. *Have a packing RSL or use recycled materials for packaging?*
8. *Low-impact care instructions for product available on website?*
9. *Product repair information available on website?*
10. *Advertise apparel take back programs or recycle worn products?*

To create this index, each question was given equal weight. For each 'yes' answer provided, a brand was given a score of 1 and a 0 for 'no'. A brand that answered 'yes' to all 10

questions was given a score of 10 with 10 having the most sustainable practices and 0 having the least.

The final index created in this data is the category of clothing item. Seven items were collected from twelve brands; women's cotton t-shirt, women's active tank top, mens active t-shirt, men's active shorts, trucker hat, wool hat, and a down jacket. To account for the difference because of material used (for example, a t-shirt requires more fabric than a tank top) and items that include other materials (such as the down jacket that also requires down), the clothing items were indexed into 7 categories.

Summary Statistics

Variable	**Observations**	**Mean**	**Std. Dev.**	**Min**	**Max**
Price	84	62.85	67.14	14.95	260
Label Index	84	0.33	0.61	0	2
Material Sustainability Index	84	2.29	0.31	1.90	2.70
Brand Sustainability Index	84	5.58	2.55	1	9

Model

The model used in this research is a hedonic price model. The "hedonic pricing" method has commonly been used within the housing market when pricing houses to include internal and external values. The hedonic price model is used to develop an estimate for the value placed on a given characteristic. Through the hedonic pricing model, we can estimate the significance or

weight given to intangible characteristics. For example, when an individual buys a house, factors such as closeness to a highway or neighborhood features factor into the price someone is willing to pay for the house. With a hedonic pricing model, one can estimate the weight that those factors carry.

This paper hypothesizes that when purchasing clothing, consumers value more than just the material being used and the face value of a piece of clothing. This research aims to understand the impact of sustainable practices on the price of outdoor apparel. Using a simple regression, we can use information on different attributes to explain and estimate the variations in price.

The hedonic outdoor apparel price model is as follows:

$$P = f(X_{i2,} X_{i3,} X_{i4,} X_{i5})$$

$$Y_i = \beta_1 + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + u_i$$

Variables

Y_i	Price
X_{i2}	Brand Sustainability Index
X_{i3}	Clothing Item Index
X_{i4}	Material Type Index
X_{i5}	Item Label Index

The first simple regression is price on just the brand sustainability index:

$$Price_i = \beta_1 + \beta_2 brandsustainability\_index + u_i$$

The second simple regression is price on the brand sustainability and the clothing index (type of clothing):

$$Price_i = \beta_1 + \beta_2 brandsustainability\_index + \beta_3 clothingitem\_index + u_i$$

The third simple regression is price on brand sustainability index, clothing item index, material index, and label index:

$$Price_i = \beta_1 + \beta_2 brandsustainability\_index + \beta_3 clothingitem\_index + \beta_4 material\_index + \beta_5 label\_index + u_i$$

brandsustainability_index	This variable is an index created to represent the sustainability of a given brand. This number can be on a scale from 0-10 and is based off of questions regarding efforts of sustainability.
clothingitem_index	This variable represents the category of clothing item which can be one of seven items: wool hat, men's athletic shorts, women's athletic tank top, men's athletic t shirt, down jacket, men's cotton shirt, trucker hat. This variable serves to account for the difference in price between different articles of clothing that could have price differences due to amount of material used, purpose of piece of clothing, and type of outdoor

	recreationalist to purchase the item (i.e. cold-weather clothing, such as the down jacket, versus warmer weather clothing).
material_index	This index represents the four different types of materials typically used to make outdoor apparel because of their durability, insulation, comfortability, and ability to wick moisture. The four types of materials are cotton, polyester, nylon, and wool. This index factors in the environmental impact of each of these materials, including GHG (greenhouse gas) emissions, energy usage, and water usage. Including this variable considers the possible influence of material over price.
label_index	This index considers the labels that brands put on specific clothing items that mark the item as organic, recycled, or Bluesign Approved. These labels could have an influence of the price of the clothing, either making an item more expensive because it costs more to produce or making is less expensive to

	incentivize customers to making ‘green’ purchases.

This paper hypothesizes that the coefficient for brand sustainability will be positive, meaning that consumers are willing to pay more for a brand that has more practices in sustainability. The coefficient for clothing item label (organic, recycled, and bluesign approved) is expected to have a positive coefficient, assuming that outdoor recreationalists, the biggest consumers of outdoor apparel, are likely to value environmentally friendly clothing and brands will charge more as a premium. The coefficient for the material index, scoring materials on their environmental impact, is hypothesized to have a negative coefficient which means that brands would charge more for clothing that is made out of more environmentally impactful materials.

Results

	Price (1)	**Price (2)**	**Price (3)**
Brand Sustainability Index	0.098 (2.911)	0.047** (2.385)	-1.765 (2.448)
Clothing Item Index	-	19.455*** (3.033)	18.388*** (2.828)
Material Index	-	-	71.054*** (18.598)
Label Index	-	-	16.830 (10.301)
R squared	0.000	0.337	0.4526

* means significant at the 95% level if P<0.05. ** If significant at the 0.05 level when P<0.01.

*** means significant at the 99.99% level when P<0.0000.

The first regression run has no significance with the R squared value being 0.000 which can be interpreted as the level of brand sustainability not explaining the variance in the price of a given type of item, accepting the Null Hypothesis with confidence. The second regression includes the clothing item index which factors in the type of item that is reflected in the price. This regression has more significance with the R squared being 0.337 and both variables are significant; *brandsustainability_index* is significant at the 95% confidence level, *clothingitem_index* is significant at the 99.99% level. This can be explained by the fact that clothing articles of similar kinds are being compared and are priced closely together.

The third regression holds the most significance with the R squared being 0.4526, meaning 45.26% of the price variation can be estimated through this model. The *brandsustainability_index* coefficient has a negative and not statistically significant value. The coefficient for *clothingitem_index* is statistically significant at the 99.99% level because it categorizes clothing items, comparing similar items to each other that are close in price. This statistical significance is expected and makes sense because the clothing items were intentionally separated in order to account for differences such as amount of material used, the purpose it is used for, and type of weather it is made for.

The *label_index* variable is not statistically significant, meaning labels and certifications on clothing items such as organic, recycled, and Bluesign Approved do not have a statistically significant impact over the price of something. Although this variable is not statistically significant, the positive sign on the coefficient makes sense, meaning that these labels have a positive impact on price.

The coefficient for the *material_index* variable is statistically significant at the 99.99% level and economically significant with the coefficient being 71.054, signifying that the type of material is reflected in the price of an item. The statistical significance of this variable is feasible because some types of materials might be more expensive to process, causing the prices of the items to be higher. This could also mean that consumers are more willing to pay for certain materials, potentially due to their quality and effectiveness for outdoor activities.

Because the third regression has the greatest r squared, this regression was run again and corrected for heteroskedasticity:

	Price **(4)**
Brand Sustainability Index	-1.976 (2.553)
Clothing Item Index	22.198*** (4.100)
Material Index	65.797** (19.327)
Label Index	19.325* (9.089)
R squared	0.4249

* means significant at the 95% level if P<0.05. ** If significant at the 0.05 level when P<0.01. *** means significant at the 99.99% level when P<0.0000.

Heteroskedasticity is not strong in this regression, but corrected for just in case. To correct for heteroskedasticity, White corrected robust variance estimates were found in order to account for constant errors in the variance. For this robust regression, the r squared is 0.4249,

meaning that it can explain 42.49% of the variation in price. This changes the results slightly, giving the *material_index* variable less statistical significance. However, the *label_index* is now statistically significant at the 95% level, meaning that labels such as organic, recycled, and Bluesign Approved might actually significantly impact the price of an item.

The magnitudes of these coefficients are feasible, with the type of material having the greatest statistical influence over price. While consumers of the outdoor apparel market seem to have an increasing interest in 'green' apparel and the trendiness of brands that are environmentally conscious, this research shows that prices of outdoor apparel do not reflect this consumer interest. Changing the purchasing patterns of consumers takes time; tracking this change over time is beyond the scope of this research, but could be a possible explanation for the statistical significance of some variables compared to others.

Conclusion

This research questioned the statistic and economic significance of sustainability factors on the price of clothing. Using a statistical regression, this research evaluates the impact on price of the level of brand sustainability, the type of material used, and labels such as organic, recycled, and Bluesign Approved. In doing this statistical analysis, we can make an estimate that the statistical impact of brand sustainability on a outdoor apparel product's price is insignificant. When corrected for heteroskedasticity, the influence of it being organic, recycled, or Bluesign Approved is positive and statistically significant. However, the price of an item shows to be most significantly impacted by the type of material used. These results show that consumers are more or less likely to pay money for a particular kind of material, possibly for reasons surrounding durability or comfortability.

The reasons for these results are beyond the scope of this research, but these findings are important because with outdoor apparel being a quickly growing industry, understanding the factors involved in pricing apparel is integral in order to move towards more intentionally sustainable production systems and programs. If consumers are not willing to pay a premium for for the sustainability of their clothing, the industry as a whole can take a closer look at what they *are* willing to pay for and work towards making those aspects more sustainable. For example, if consumers will pay more for a shirt made out of polyester rather than cotton, the industry can find ways to make polyester more environmentally and socially friendly, such as using recycled polyester. Recognizing the economic opportunity and working from there to integrate social and environmental sustainability could lead towards a more holistic approach to sustainability in the outdoor apparel industry.

While we can learn from these results, there are limitations to this research. Firstly, this research has a small sample size of only 84 data points. Because this data was self compiled and selected, the small sample size decreases the statistical significance of the results. With more data, more accurate estimates can be made about these results. Another limitation from this study is the inclusion of data from down jackets; down jackets are typically more expensive than other outdoor apparel items because in addition to being made of nylon or polyester, they also contain down which can have an expensive production process. However, while down jackets are not 100% nylon or polyester, they represent the winter lines of clothing that include different types of insulation.

Further research on this topic can be done with a larger sample size to better estimate the statistical weight of different factors of sustainability on products. Beyond this, better

understanding why certain factors have an influence over consumer purchasing patterns can provide manufacturers and brands with insight on what people are willing to buy and therefore work towards making those areas more socially and environmentally sustainable.

As the outdoor recreation industry grows, the demand for outdoor apparel is likely to grow as well; establishing practices that meet standards of economic, environmental, and social sustainability standards is crucial. While specific practices of brands might not be influential over price, accruing a reputation among consumers for being 'eco-friendly' and 'green' could build brand image and therefore develop greater brand loyalty. If consumers are unwilling to pay a premium for sustainability, they might be more willing to buy apparel for the brand name attached to it. Further research in economics, psychology, and behavioral economics on this topic would allow for a better understanding of producer and consumer behavior in order to optimize economic success, profitability, and social and environmental benefit.

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